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STATE OF UTAH COMPILATION OF NEDS DATA

R. Hall, et al

GCA Corporation
Bedford, Massachusetts

December 1973

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Compilation of NEDS Data

Prepared by:
R. Hall, J. Bartlett, N. Surprenant

GCA CORPORATION
GCA TECHNOLOGY DIVISION
Bedford, Massachusetts

For

U.S. ENVIRONMENTAL PROTECTION AGENCY
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SECTION I
INTRODUCTION

This report describes the work that GCA Technology Division performed in updating the National Emission Data System (NEDS) for Utah for the EPA.

The point source data was obtained from the files of the Air Quality Section of the Utah State Division of Health. Data for about 80 sources was recorded on NEDS point source forms. Sources with the potential to emit over 25 tons/year of any of the five major pollutants, (particulates, sulfur dioxide, nitrogen oxides, hydrocarbons, and carbon monoxide) were included.

The Air Quality Section of the Utah State Division of Health completed the NEDS area source forms during August 1973. GCA evaluated the methods used and thoroughly checked the area source forms.

In order to present the geographical distribution of emissions in the area of the highest emissions, a grid system for the Davis, Salt Lake, Utah, and Weber County areas was developed by GCA. The grid consisted of 312 squares ranging in size from 400 km^2 to 1.57 km^2. Emissions from all sources were calculated for each grid.

SECTION II

SUMMARY OF POINT AND AREA SOURCES

The results of the emission inventory are summarized in Tables 1 and 2. Table 1 summarizes the data by Air Quality Control Region and source type. Table 2 summarizes the data by county and source type. Figure 1 is a map of Utah, the Air Quality Control Regions, and the counties. A general discussion of the results for each of the five pollutants is presented in the following sections.

A. Particulates

1. Statewide, 36% of the calculated particulate emissions were from area sources. Combustion of coal by industry was responsible for over half of the area source particulate emissions. Point sources accounted for 64% of the particulate emissions. About one-third of the point source emissions were from coal combustion.

2. The particulate emissions rates from the three AQCR's were quite different. Only 3% of the total particulate emissions in Utah occurred in the Four Corners Interstate AQCR. Particulate emissions in the small Wasatch Front Intrastate AQCR accounted for 67% of the particulate emissions in Utah.

B. Sulfur Dioxide

1. Area sources accounted for only 9% of the sulfur dioxide emissions in Utah. Industrial combustion of distillate oil, residual oil and coal was the primary area source of sulfur dioxide. A copper smelting operation in the Wasatch Front AQCR was responsible for 65% of the sulfur dioxide emitted in Utah. The remainder of the point source sulfur dioxide emissions was caused by fuel burning.

2. Sulfur dioxide emissions from the Wasatch Front AQCR were 92% of the state total. Point sources in the Wasatch Front AQCR accounted for 85% of the sulfur dioxide emitted in Utah.

C. Nitrogen Oxides

1. Area sources account for 77% of the nitrogen oxides emission in Utah. On and off highway fuel use accounts for over half the nitrogen oxide emissions. Point source emissions of nitrogen oxides are caused by fuel burning operations. The

largest point sources are petroleum refining and metallurgical industries.

2. The Wasatch Front Interstate AQCR accounts for 68% of the nitrogen oxide emissions in Utah.

D. Hydrocarbons

1. Area sources account for 92% of the hydrocarbon emissions. Over 60% of the hydrocarbon emissions are from transportation sources. Evaporative sources account for about 8% of the hydrocarbon emissions. Petroleum refining and the metallurgical industry are the primary hydrocarbon point sources.

2. The Wasatch Front AQCR accounts for 64% of the hydrocarbon emissions in Utah. Point sources in the Wasatch Front AQCR account for 99% of the point source hydrocarbon emissions in Utah.

E. Carbon Monoxide

1. Area sources account for 97% of the carbon monoxide emissions. About 90% of the carbon monoxide emissions are from transportation sources. Point source emissions occur primarily from petroleum refining and the metallurgical industry with significant emissions also occurring from solid waste disposal and large fuel burning sources. Petroleum refineries and large metallurgical operations have carbon monoxide controls.

2. The Wasatch Front AQCR accounts for 65% of the carbon monoxide emissions in Utah.

SECTION III
SUMMARY OF GRID RESULTS

The study area for this grid system consisted of Davis, Salt Lake, Utah and Weber counties in the Wasatch Front Intrastate AQCR. The only county in the Wasatch Front AQCR not included in the grid system was Tooele county. The grid system, using UTM coordinates, consisted of 312 square grids ranging in size from 400 km^2 to 1.57 km^2. The smaller grids were located in the more densely populated areas. Figures 2-8 are maps of the grid system. Figure 2 is an overall map, while Figures 3-8 are maps of inset areas.

The emission density maps, Figures 10-14, and Table 3 summarize the results of the grid system study. Table 3 listing the emission rates (10^{-3} tons/day) for the overall area and each inset area shows that the majority of the emissions occur in the inset areas. Table 3 shows that 67% of the particulates, 27% of the sulfur dioxide, 59% of the nitrogen oxides, 78% of the hydrocarbons and 76% of the carbon monoxide emissions occur in the inset areas. Figures 10-14 show the much higher emission densities (10^{-3} ton/day-mi^2) that occur in the densely populated inset areas.

Emissions for each grid were calculated by a computer program. For each grid, Table 4 lists the area (square miles) and the emission density for each of the five major pollutants. Additional data including a table for each grid, listing emission densities for each pollutant and source type has been calculated and is available. The following source types are included in the above table:

Point Sources

Area Sources

- Residential
  - Bituminous Coal
  - Distillate Oil
  - Natural Gas
- Commercial-Institutional
  - Bituminous Coal
  - Distillate Oil
  - Residual Oil
  - Natural Gas

Industrial

- Bituminous Coal
- Distillate Oil
- Residual Oil
- Natural Gas

Diesel Fuel

- Off Highway
- Railroads

Evaporation

- Solvent
- Gasoline

Incineration

- Industrial
- Commercial

Limited Access Roads

- Light Vehicles
- Heavy Vehicles
- Heavy Vehicles - Diesel

Rural Roads

- Light Vehicles
- Heavy Vehicles
- Heavy Vehicles - Diesel

Urban Roads

- Light Vehicles
- Heavy Vehicles
- Heavy Vehicles - Diesel

Off Highway - Gasoline

Airports

Emissions from sources not included in the above list are not significant or unknown.

SECTION IV
POINT SOURCE METHODOLOGY

The purpose of the point source emission inventory was to complete NEDS point source forms on all sources emitting over 25 tons/year (before control equipment) of any of the five major pollutants. The Air Quality Section of the Utah State Division of Health conducted the point source data collection. Information on approximately 80 plants was furnished to GCA. It was necessary to use 1970 data for about 6 sources as no new data had been collected. GCA designed a mailing list of potential sources in an effort to be sure that all sources had been located. The mailing list was inspected by personnel of the Air Quality Section and they determined that it contained no additional sources.

NEDS point source forms were completed for the following types of sources: solid waste disposal facilities, electric power generation plants, feed and grain elevators, phosphate fertilizer manufacturers, nitrate fertilizer manufacturers, copper smelting, iron and steel mills, gray iron foundries, secondary lead smelters, brick and clay products, portland cement manufacturers, clay sintering plants, coal drying plants, concrete batch plants, lime manufacturing plants, gypsum manufacturing plants, asphalt concrete plants, perlite manufacturing plants, phosphate rock processing plants, sand and gravel processing plants, stone quarrys, petroleum refineries and various establishments with boilers. The largest individual sources were copper smelters, steel plants, petroleum refineries and electric power plants.

NEDS point source forms were completed according to the directions in "Guide for Compiling a Comprehensive Emission Inventory."[1] About 200 point I.D.'s were completed for the 80 plants included in this inventory. Whenever possible, plant data was broken down into individual source data and entered on separate point I.D. forms. UTM coordinates to the nearest one-tenth of a kilometer were generally available from Utah personnel. When necessary, GCA used 1/24,000 scale U.S.G.S. maps to obtain the UTM coordinates. Stack data when available was recorded. Pollution control efficiencies reported by sources were almost always used. In cases where the pollution control

efficiency was unreasonable or not given, the efficiency was estimated from data in AP42-1[2] and AP42-2[3]. Emission data from stack sampling was available from some sources and was always used. For sources not reporting emissions, the emissions were calculated from data in AP42-2. Utah air pollution control regulations were used to calculate allowable particulate emissions for sources not located in the Wasatch Front Intrastate AQCR and to calculate allowable sulfur dioxide emissions regardless of location. Allowable particulate emissions for sources located in the Wasatch Front Intrastate AQCR were calculated according to new regulations[4] issued by the EPA in May 1973. When the sulfur or ash content of a fuel was unavailable it was assumed to be equal to the area source sulfur or ash content as reported by Utah personnel.

SECTION V

AREA SOURCE METHODOLOGY

The NEDS area source forms were completed by the Air Quality Section of the Utah State Division of Health. The methods used generally followed chapter 5 of APTD 1135[1] and are outlined below.

A. Emission Estimates

Emission estimates were calculated from emission factors found in AP42-1[2]. Aircraft emissions were calculated from data on LTO's, type of aircraft and number of engines per plane.

B. Residential Fuel

Residential use of bituminous coal, distillate oil and wood was calculated from census data on the number of dwelling units using each fuel in each county[5], the average number of rooms per dwelling unit in Utah,[5] degree day data and the fuel consumption factors in APTD 1135. Natural gas use was obtained from dealers.

C. Commercial - Institutional Fuel

Commercial-institutional bituminous coal, distillate oil and residual oil use was determined from the latest Bureau of Mines data.[6,7] When necessary, the residential and point source commercial-institutional fuel use was subtracted from the Bureau of Mines data before apportioning to counties. The above fuel use was apportioned to counties by population.[8] Commercial-institutional natural gas used by county was obtained by contacting natural gas dealers.

D. Industrial Fuel

Industrial bituminous coal, distillate oil and residual oil use was obtained from the latest Bureau of Mines data.[6,7] After subtracting industrial point source fuel usage the remaining fuel use was apportioned to counties by manufacturing employees.[8] Industrial natural gas usage was determined by contacting natural gas dealers.

E. On Site Incineration and Open Burning

On site incineration and open burning estimates were determined from the national per capita averages as indicated in APTD 1135[1]. County and urban population was obtained from the 1970 census.[8] Open burning by industrial and commercial-institutional sources is prohibited in Utah so zeroes were

entered in the appropriate spaces. Residential open burning is prohibited in Davis, Salt Lake, Utah and Weber counties so zeroes were entered for open burning in those counties.

F. Gasoline Fuel

Data in "Vehicle Miles on Utah Highways 1972"[9] and an additional table published by the Utah Highway Department[10] was used to determine gasoline fuel used and measured vehicle miles. The first publication contains VMT data by county and vehicle type but only includes state or federally aided roads. The second publication includes all roads but only VMT data by road type for the whole state. Local rural roads, not state or federally aided, account for 17% of the rural VMT so the county VMT data in the first publication was increased by 17% to include these roads. Similarly, county VMT data for urban areas was increased by 30% in order to include local urban or municipal roads.

Heavy vehicle gasoline usage was determined by subtracting the state diesel VMT from the state heavy vehicle VMT and then dividing by an average fuel consumption of 8.4 miles per gallon. The state heavy vehicle gasoline was apportioned to counties by heavy vehicle VMT data.

Light vehicle gasoline was determined by subtracting the heavy vehicle gasoline from the total taxed gasoline and then adding the gasoline used by government vehicles. Light vehicle gasoline use was apportioned to counties by VMT data.

Off highway gasoline consumption was calculated from the factors of 1000 gallons/tractor-year and 13 gallons/person as specified in APTD 1135[1]. Data on tractors in Utah was obtained from the "Census of Agriculture". Off highway gasoline was distributed to counties by population.

G. Diesel Fuel

On highway heavy vehicle diesel fuel consumption was obtained from the Utah State Tax Commission. Heavy vehicle diesel fuel was apportioned to counties by county heavy vehicle VMT data.

Off highway diesel fuel was calculated by using the factors of 1000 gallon/tractor year, 5000 gallons/year per non-building construction employee and 7.4 gallons/person as specified in APTD 1135.[1] In addition, it was known that a large open pit mining operation in Salt Lake county uses 7,000,000 gallons/year or 1000 gallons/employee. Therefore, an additional factor of 1000 gallon/mining employee was used.

Diesel fuel use for mining was only a small part of the total off highway diesel fuel use in all counties except Salt Lake County. County off highway diesel fuel consumption was calculated directly from each of the above factors.

Diesel fuel usage by railroads was obtained by contacting railroad companies.

H. Aircraft

Aircraft LTO cycles were determined from a study done by a university in Utah. Also military airfields were contacted.

I. Vessels

Fuel use by vessels was expected to be a very small source of air pollution in Utah, so it was assumed to be zero.

J. Evaporation

Solvent purchased was determined from the factor of 2.7 pounds per person per year for dry cleaning and the additional factors for surface coating and degreasing as listed in Table 5.2 in APTD 1135.[1]

Gasoline marketed was calculated by summing the previously calculated gasoline use.

K. Measured Vehicle Miles

The data in Vehicle Miles on Utah Highways was adjusted as previously discussed in the section on gasoline fuel and was used as measured vehicle miles. Limited access road VMT was obtained from VMT on interstate highways. Rural road VMT were obtained from the rural category. The suburban and urban VMT total were assumed to equal the urban category in Vehicle Miles on Utah Highways. The suburban and urban road VMT were estimated by separating the inner city travel and the travel on the fringes of the city.

L. Miscellaneous Sources

1. Dirt road vehicle miles traveled was estimated from data on the type of road, length of road and the average number of vehicles/week for each type of road. Each county was done separately by maps.

2. Dirt air strip data was obtained from the Utah Aeronautics Commission.

3. Construction land area was assumed to be the area likely to be damaged by wind as reported on U.S. Soil and Conservation maps.

4. Rock handling and storage data was obtained from replies to questionnaires by sources that were too small to be point sources.

5. Forest fire and stack burning data by county was obtained from the state forest service.

6. Frost control in Utah is very small and was assumed to be zero.

7. Structure fires were calculated by using the factor of 4 fires/1000 people as specified in APTD 1135.[1]

8. There is no coal refuse burning in Utah.

GCA reviewed all area source categories. However, the emission estimates were not re-calculated. The total off highway diesel fuel use exceeded the published Bureau of Mines total by 82%. Off highway diesel fuel use calculated for mining was only a small contribution to all counties except Salt Lake where it is known to be accurate. Therefore, the numbers were not changed. Methods used to estimate suburban VMT may not have been accurate and the data entered in NEDS forms should really be measured vehicle miles travelled. No revisions on the NEDS area source forms were made by GCA. However, when the data was used for the grid system, suburban and urban VMT were combined and treated as urban.

SECTION VI
GRID SYSTEM METHODOLOGY

The purpose and results of the grid system study have been previously described in section III. The purpose of this section is to describe the methods used to design the system and calculate the emissions. Since the grid data will be used in meteorological dispersion models, all grids must be square. Higher emissions usually occur in more densely populated areas, so to better present the distribution of emissions, smaller grids were drawn in those areas. Maps showing the grid system are presented in Figure 2-8. The population in each grid was determined from 1970 census tract maps.[12,13,14]

Figure 9 shows some of the census track that were used to determine the population of the grid in Figure 8.

NEDS area source data, completed in August 1973 by the Air Quality Section of the Utah State Division of Health was used extensively. Individual county totals for residential, commercial-institutional and industrial fuel use was apportioned to grids in the county by population. County totals for on site incineration, solvent purchased, and gasoline marketed were also apportioned to grids by population. Off highway diesel fuel and gasoline were apportioned to grids by area. However, before apportioning off highway diesel fuel, the 7,000,000 gallons used at the large open pit copper mine in Salt Lake county were assigned to the appropriate grid as a point source.

Data was obtained from the Air Quality Section of the Utah State Division of Health on diesel fuel usage by railroads. The data included the amounts used in each county in both railroad yards and on open tracks. The diesel fuel used in each county in railroad yards was apportioned to grids by the relative size of the railroad yards on 1/24,000 scale U.S.G.S. maps. Diesel fuel used on open tracks was apportioned to grids by track miles.

Airport LTO cycles for each of the 9 airports in the grid study area were obtained from the Air Quality Section of the Utah State Division of Health. Airport locations were determined from 1/24,000 scale U.S.G.S. maps and assigned to the appropriate grids.

Three methods were used to determine the vehicle miles travelled in the grid areas. Traffic flow maps[15] were used for grids 117-120 and 124, 125 in Ogden and grids 289, 291, 298, 299, 301, 302, and 305 in the Provo area. Vehicle miles travelled in 239 traffic zones in the Salt Lake City area have been published.[16] The grids for the present study were drawn over the 239 traffic zones and the VMT data was apportioned to grids 177, 179, 181, 186-208, 211-230, 232, 237-246, 251-260. County VMT data were apportioned to all other grids by population. In Salt Lake county, 71% of the VMT were assigned to grids by the traffic zone method.

Emissions from all of the above sources were calculated using area source emission factors and methods obtained from the Environmental Protection Agency in Durham, North Carolina. Tables 5 and 6 list the emission factors that were used. Appendix A describes the methods used to calculate motor vehicle emissions.

A computer program was written and used to apportion sources to grids, to calculate emissions, and to do the summations and calculations necessary for the final data output. Point source emissions which had been previously calculated were assigned to grids by hand and included in the final computer outputs and summations.

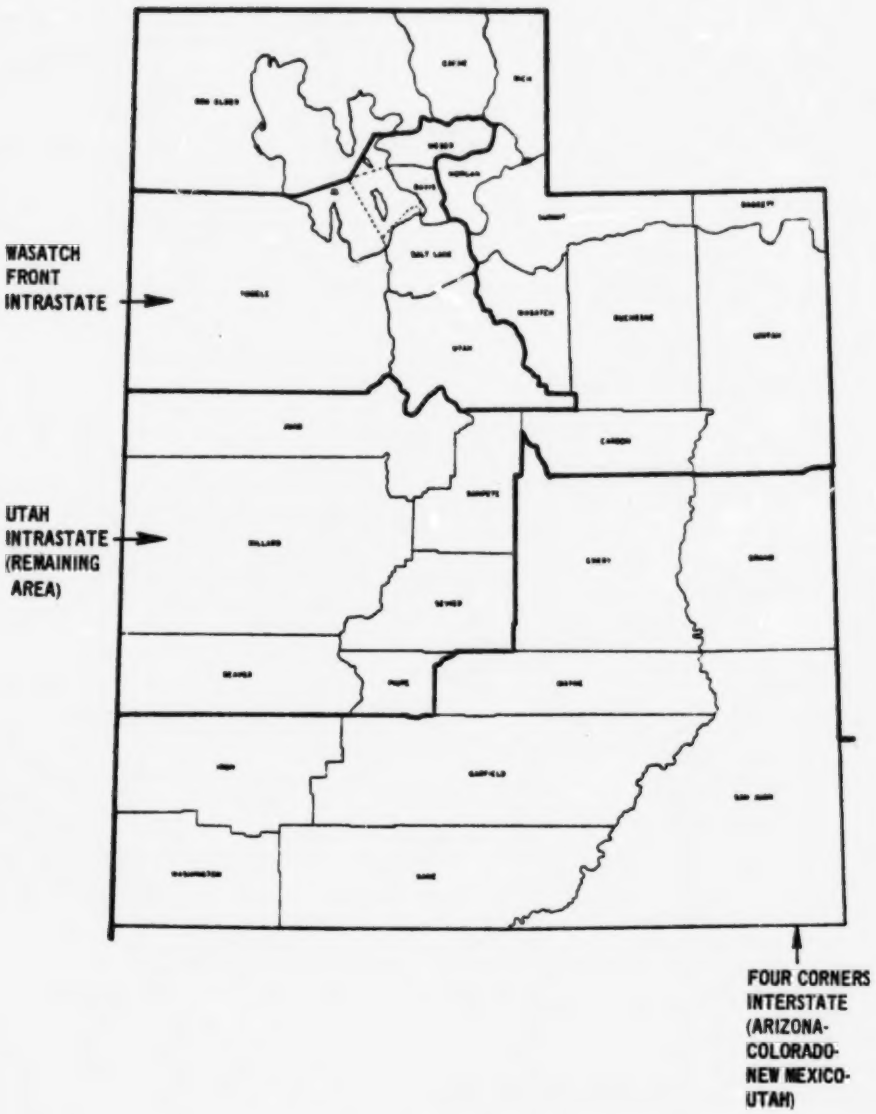

Figure 1. Map of Utah (Air Quality Control Regions, and Counties)

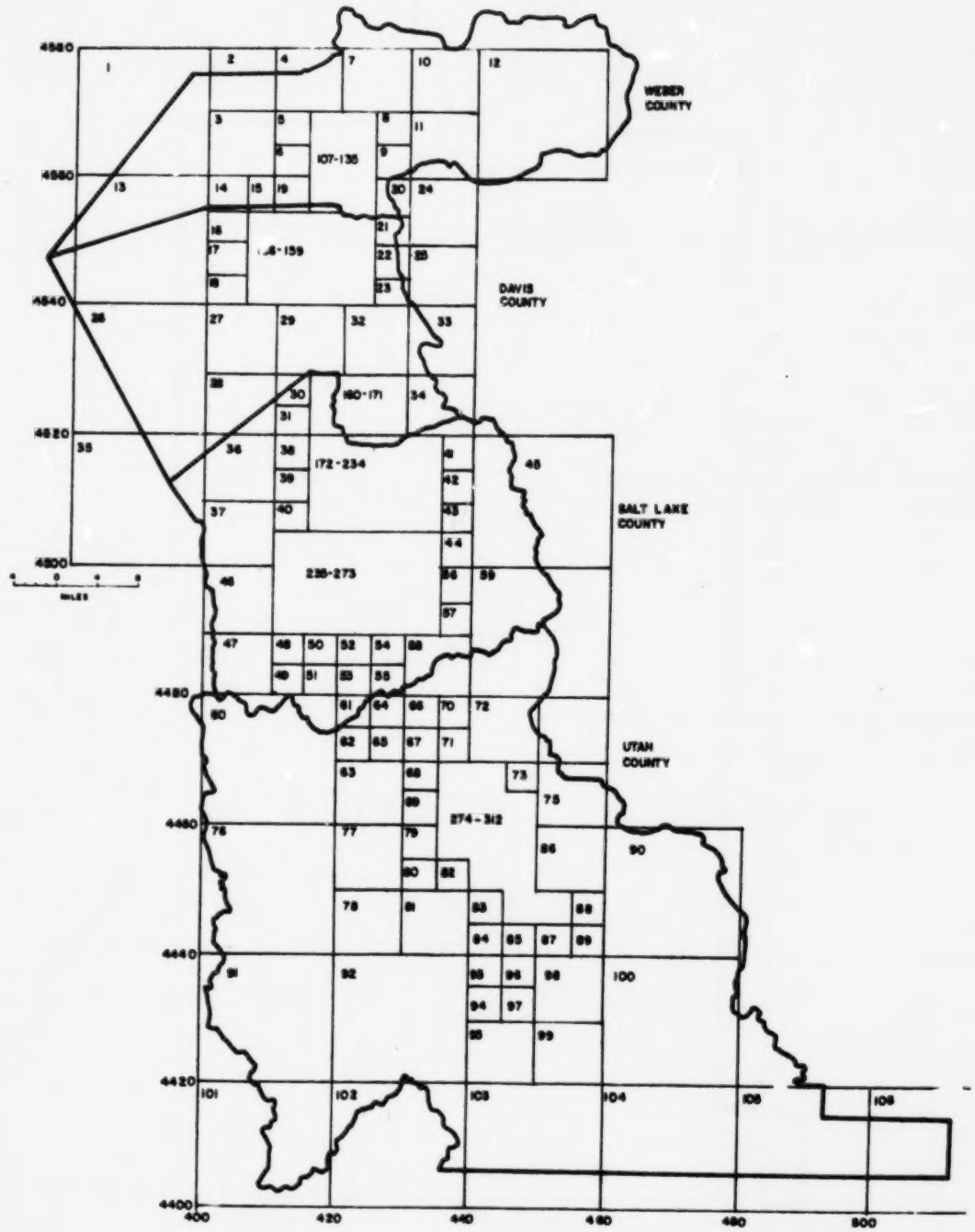

Figure 2. Overall map of grid system

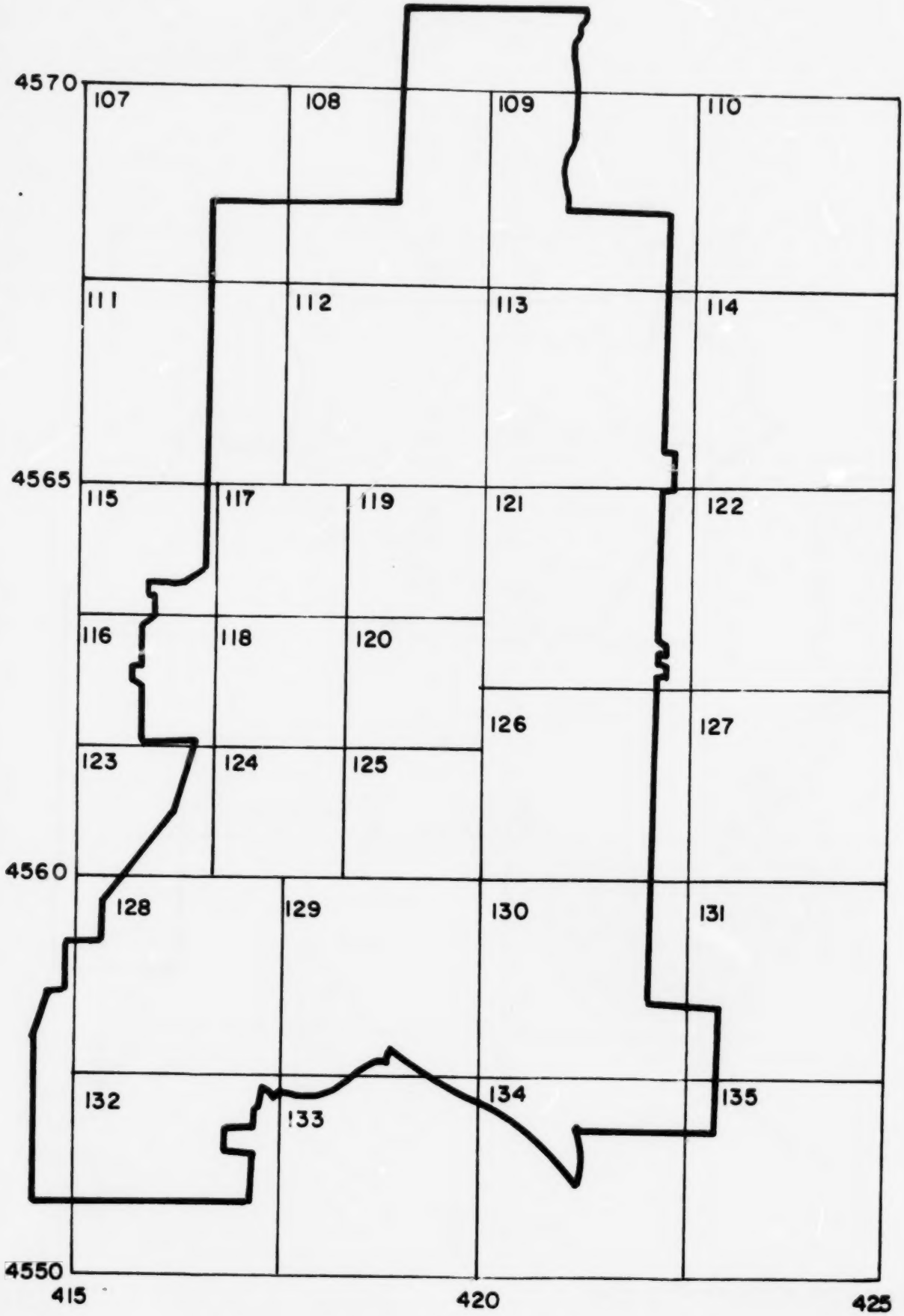

Figure 3. Grids 136 - 159

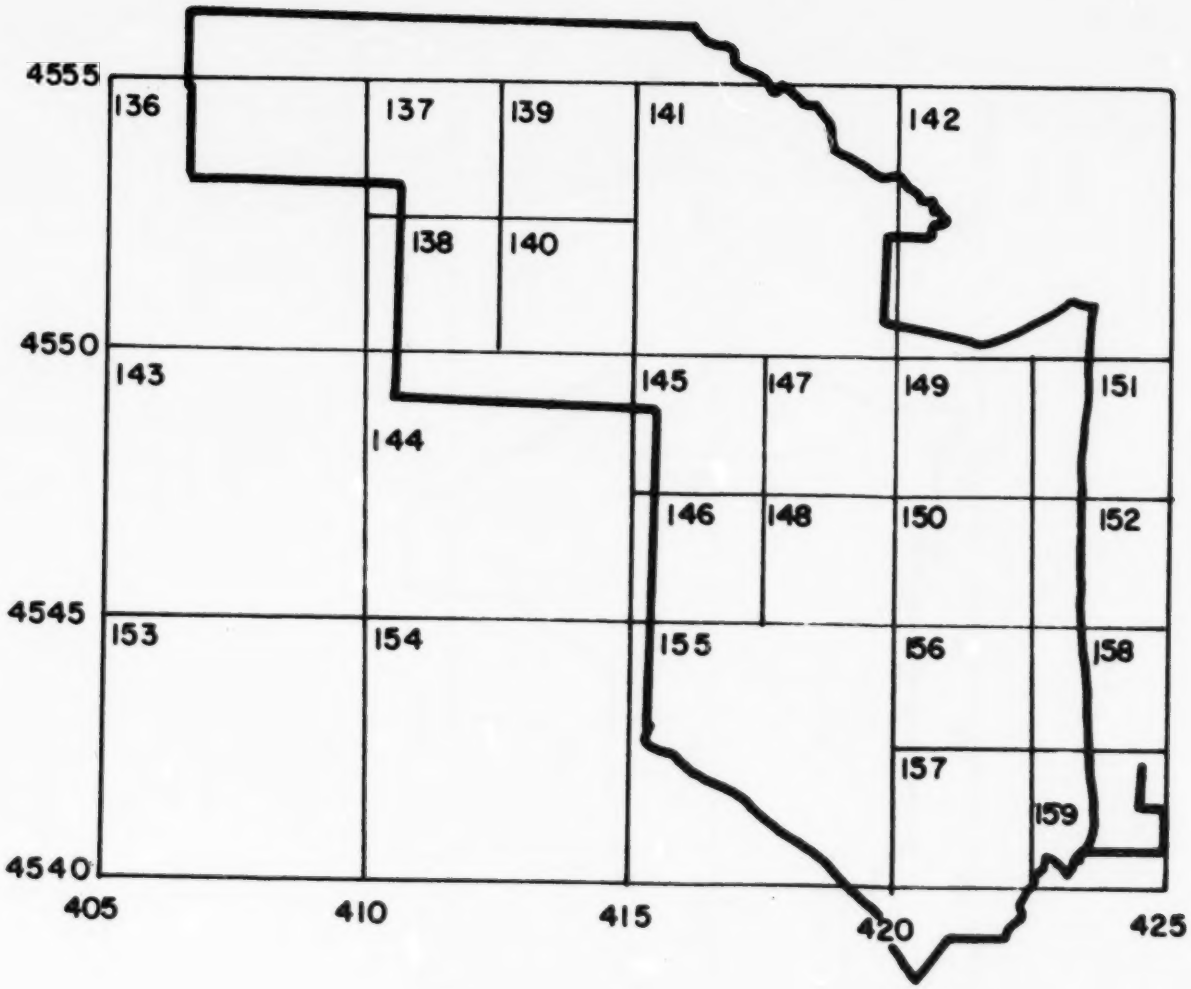

Figure 4. Grids 136 - 159

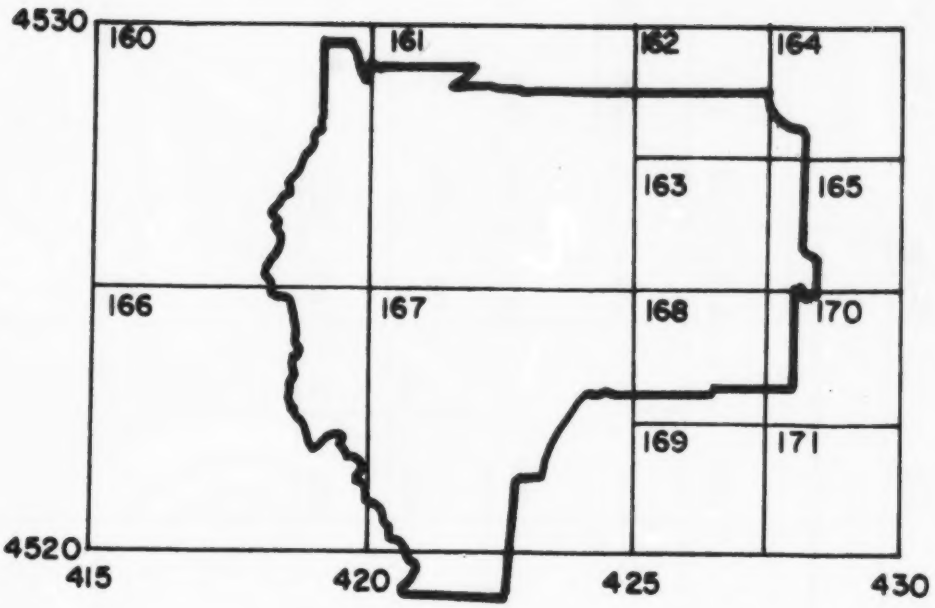

Figure 5. Grids 160 - 171

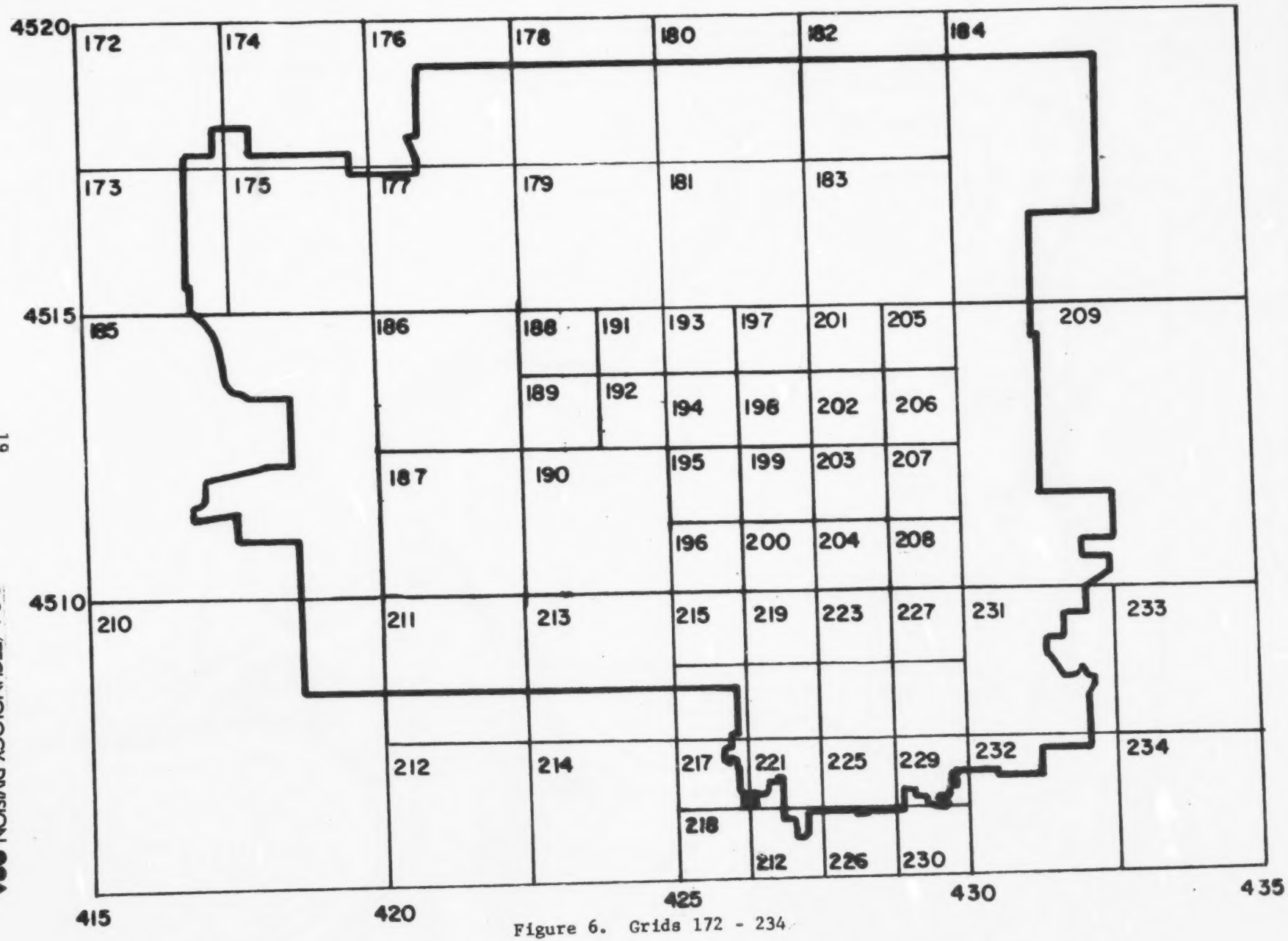

Figure 6. Grids 172 - 234

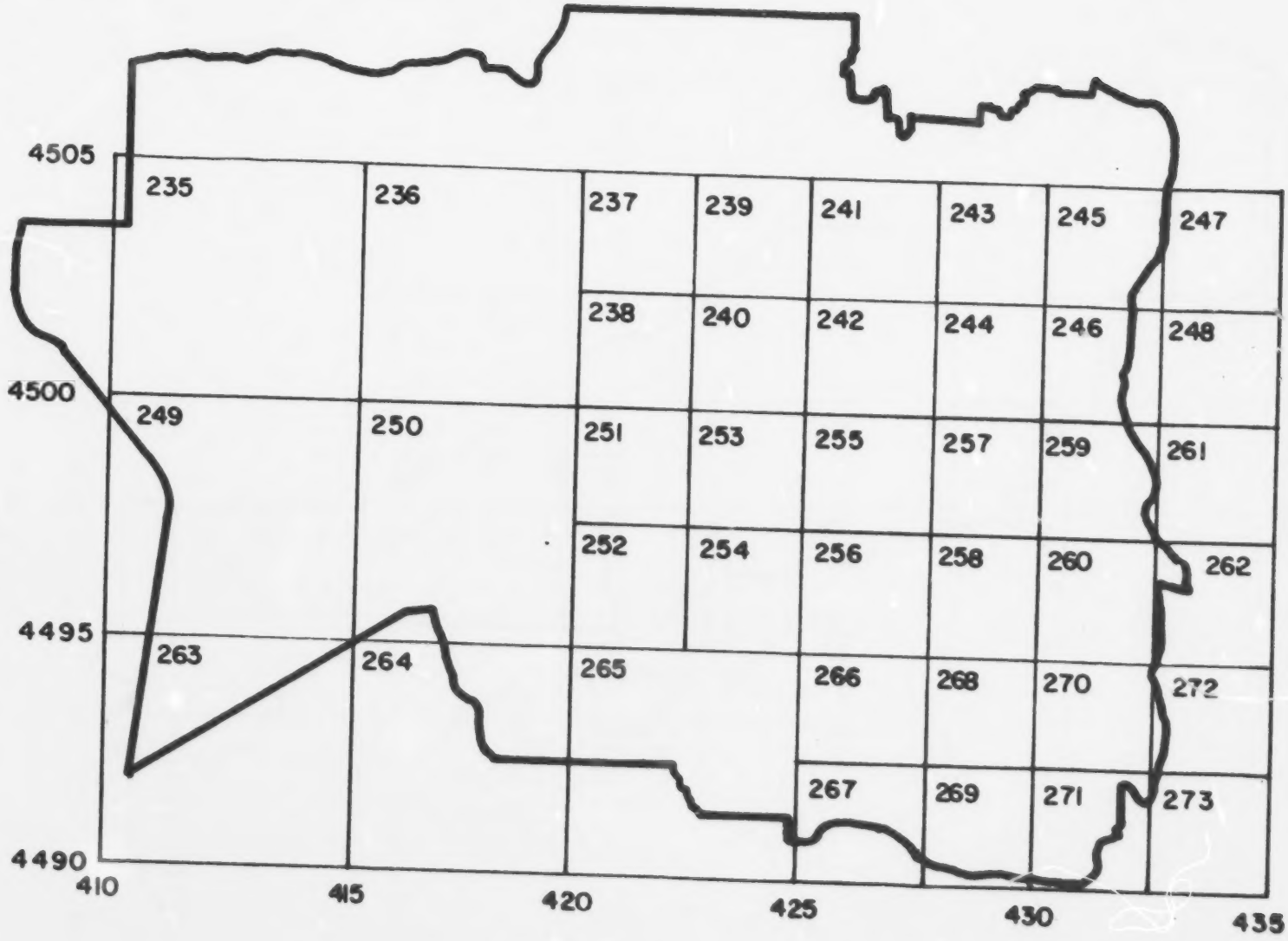

Figure 7. Grids 235 - 273

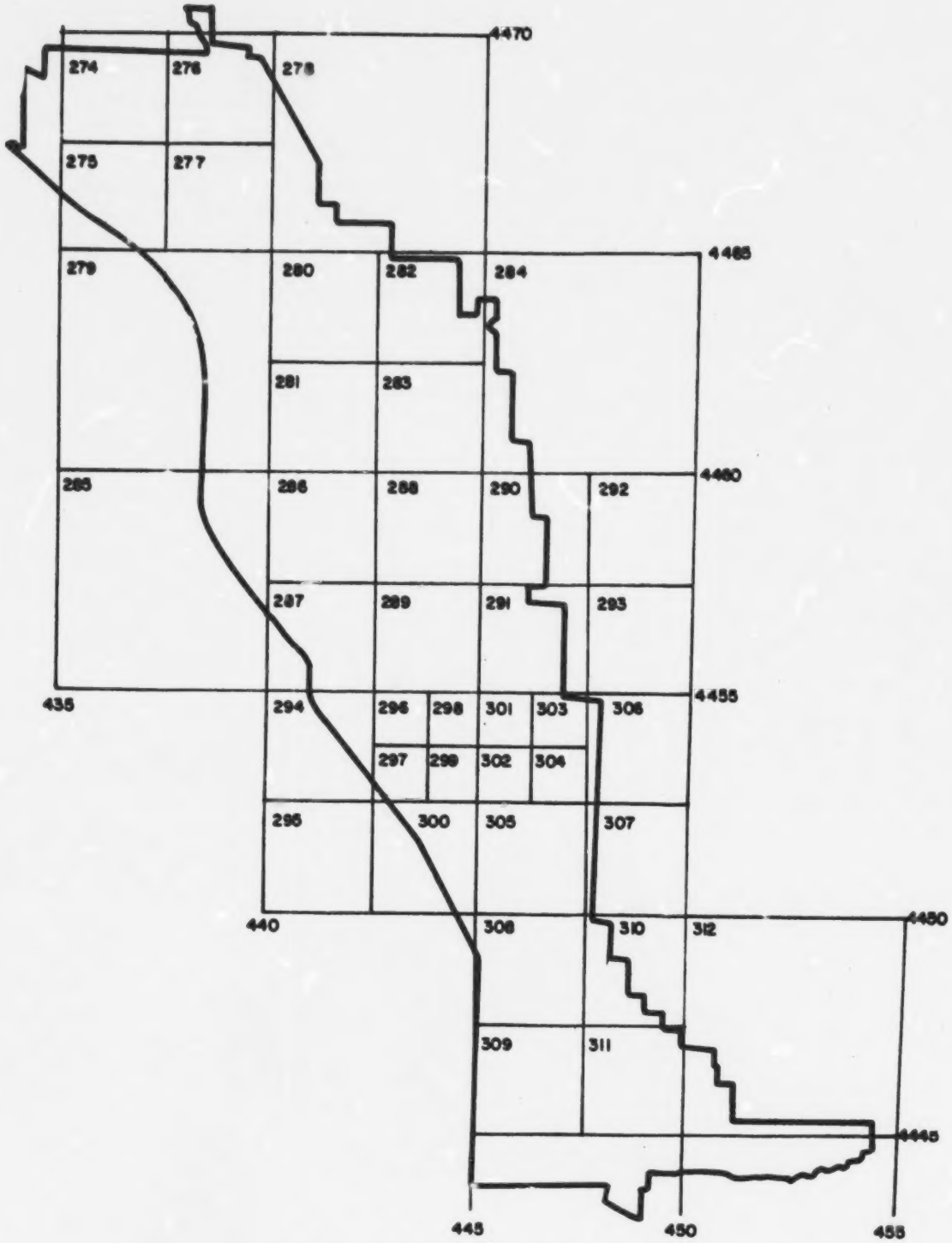

Figure 8. Grids 274 - 312

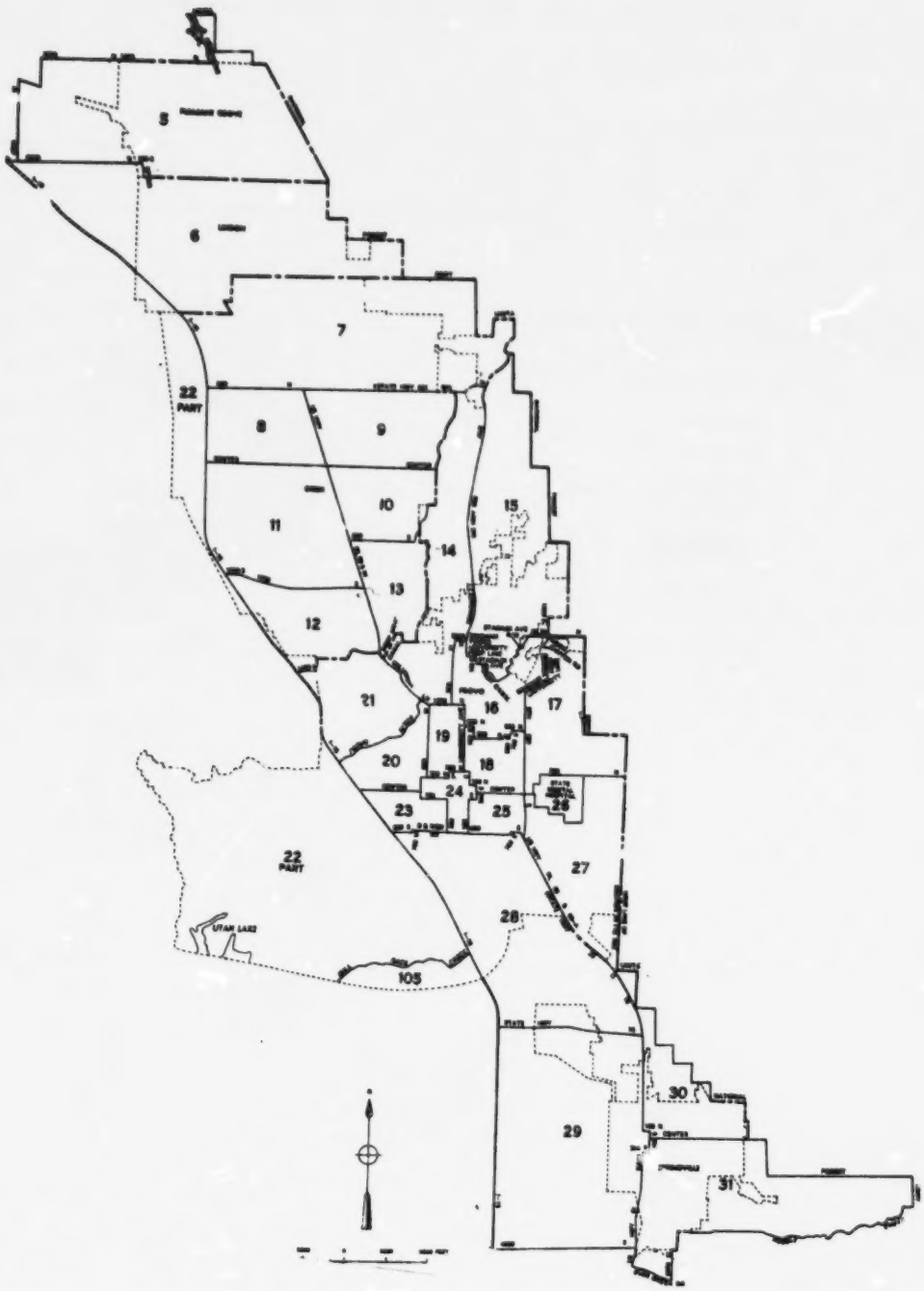

Figure 9. Census tracts, Provo-Orem and vicinity

Figure 10. Weber, Davis, Salt Lake, Utah Counties

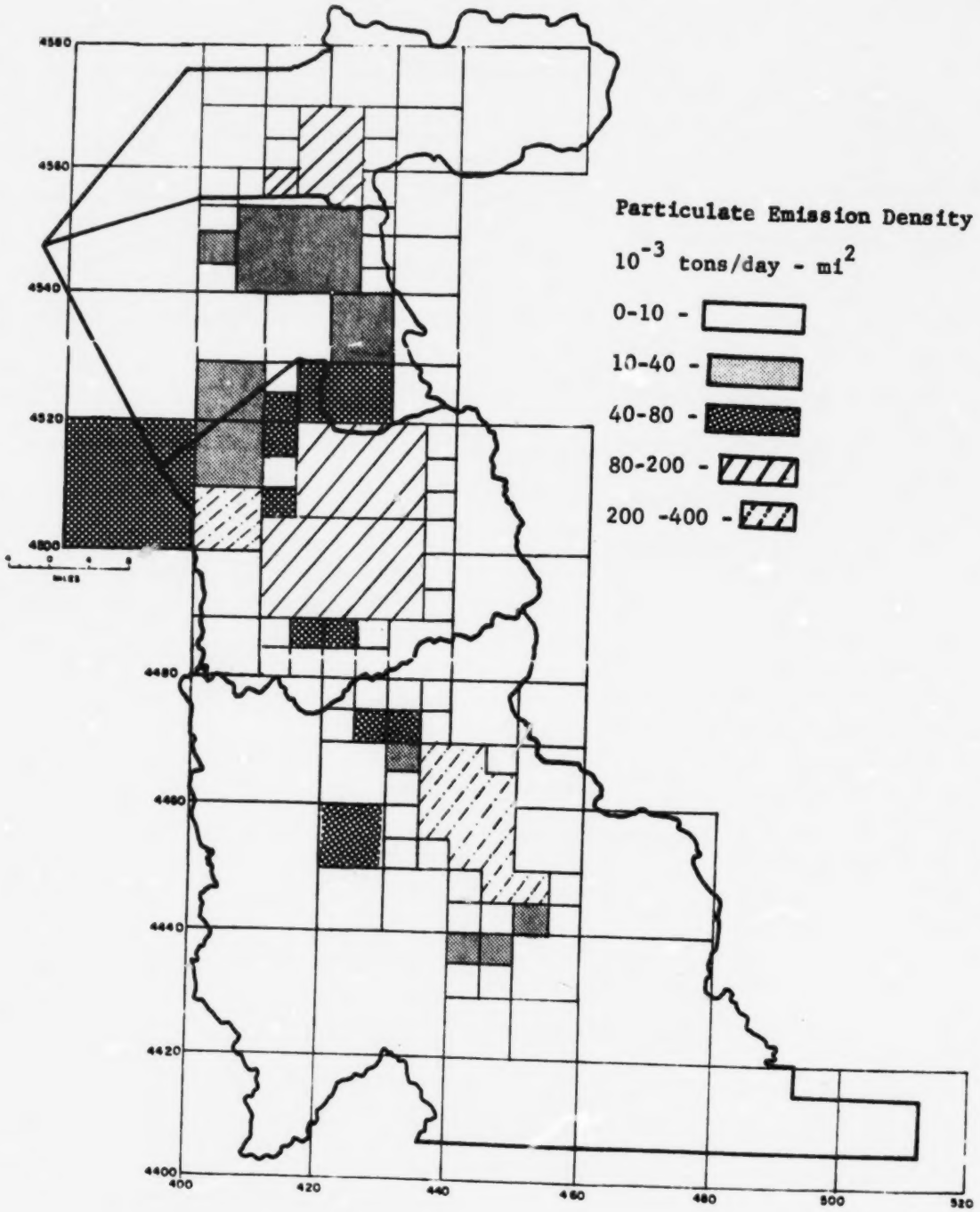

Figure 11. Weber, Davic, Salt Lake, Utah Counties

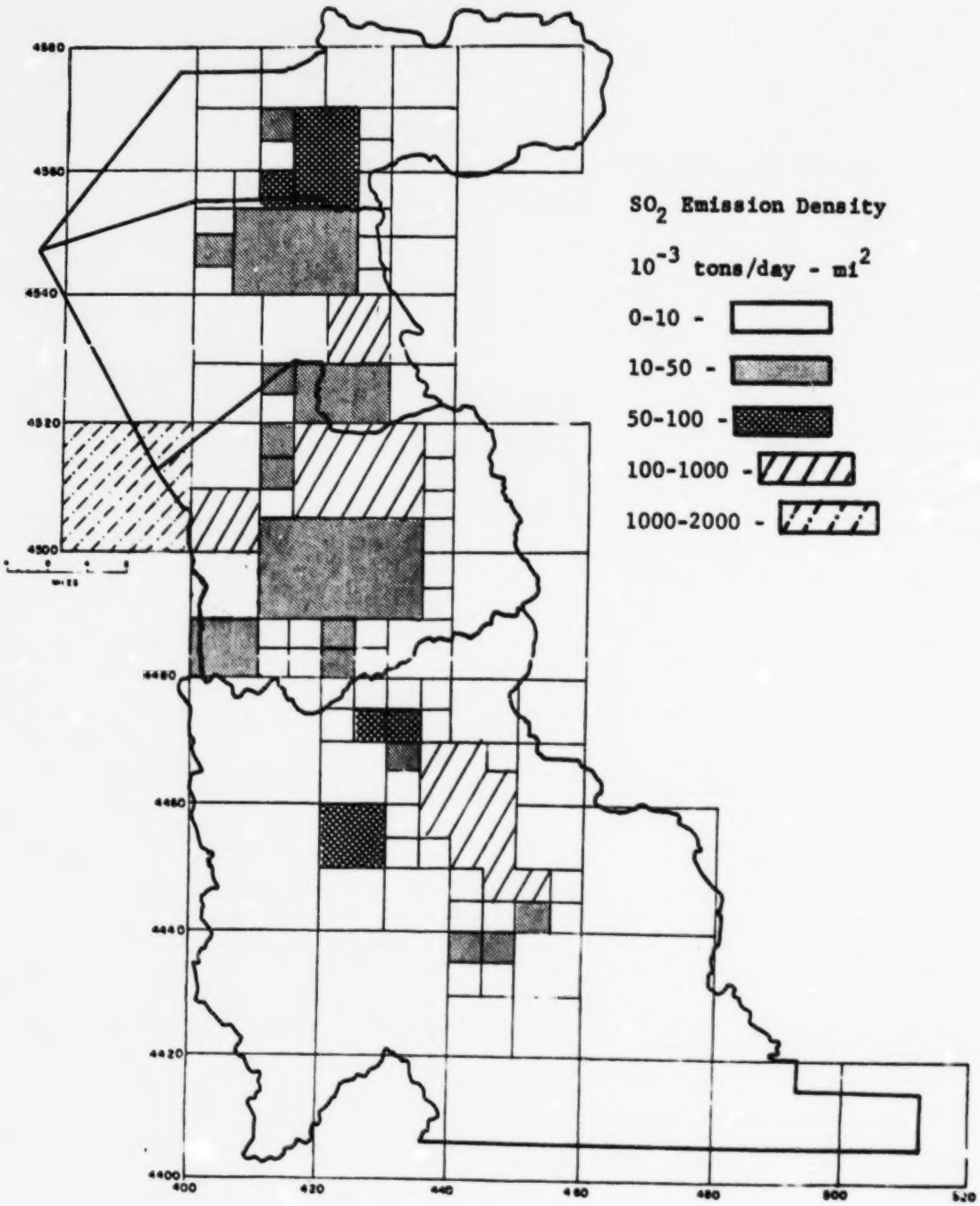

Figure 12. Weber, Davis, Salt Lake, Utah Counties

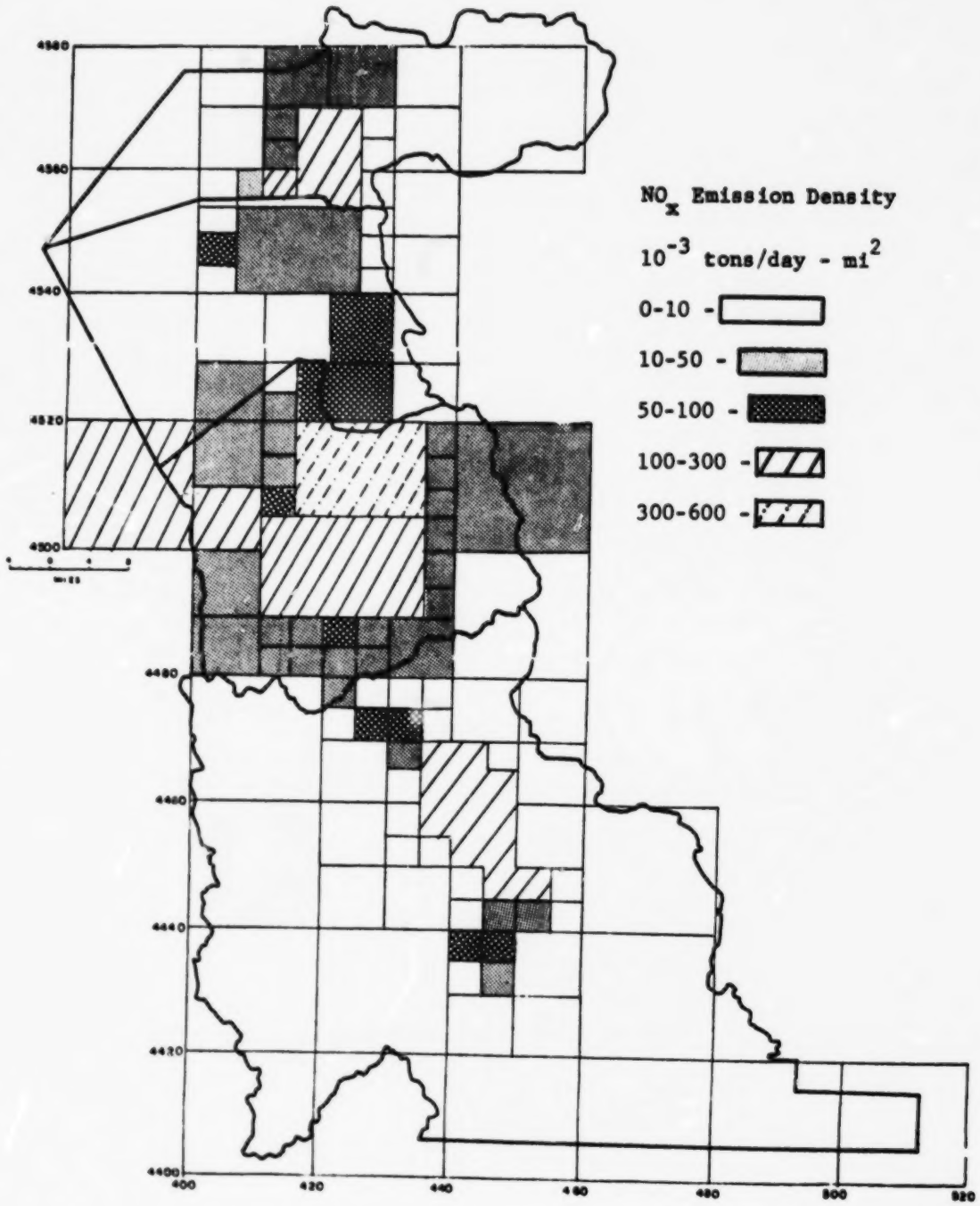

Figure 13. Weber, Davis, Salt Lake, Utah Counties

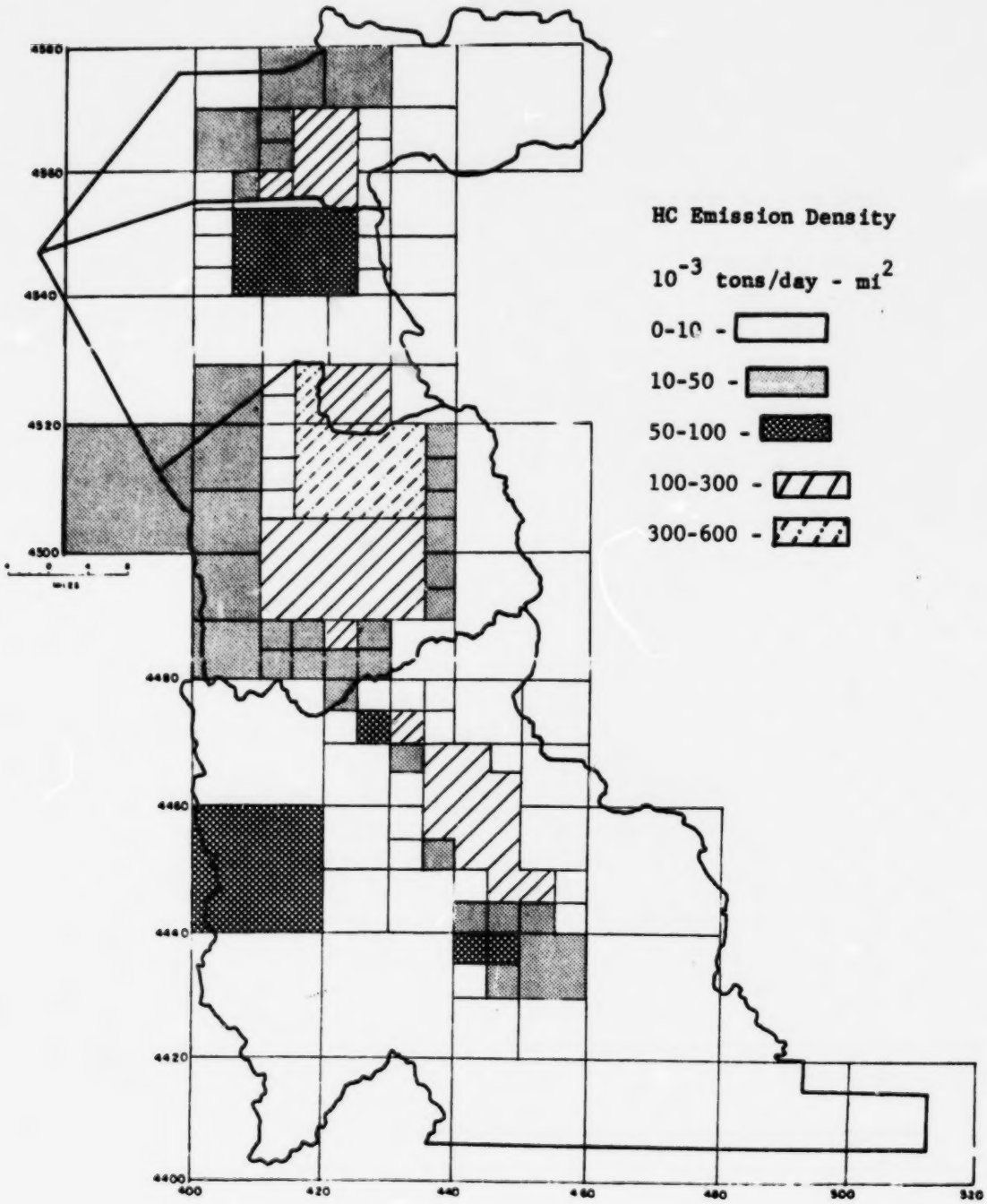

Figure 14. Weber, Davis, Salt Lake, Utah Counties

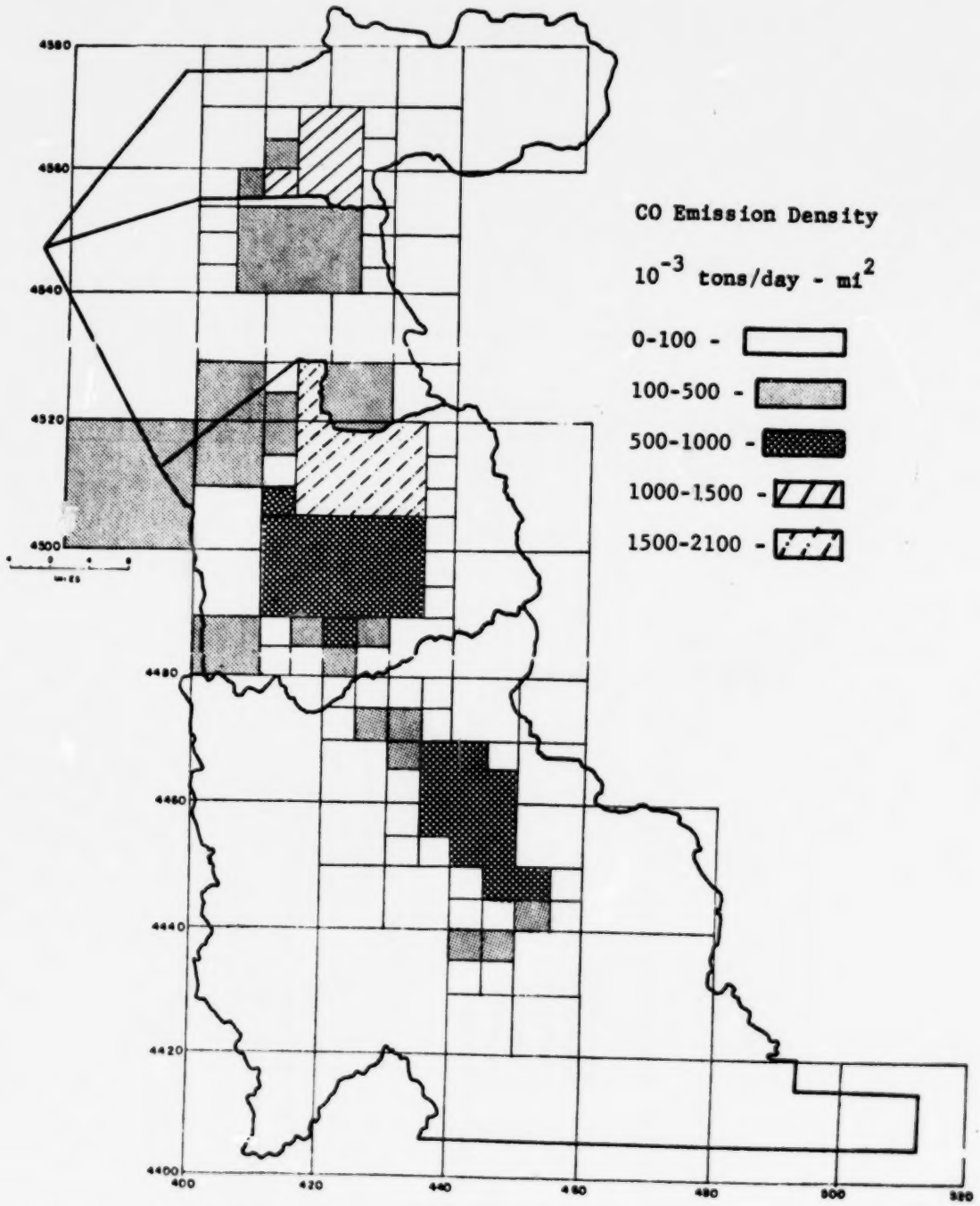

Table 1. Tons of pollutant/year

	Particulate	SO_2	NO_x	HC	CO
TOTAL ALL REGIONS	68,229	161,073	104,583	124,323	531,951
Four Corners Interstate AQCR	1,987	1,702	8,500	15,126	51,041
Area Sources	1,700	1,600	8,400	15,100	48,500
Point Sources	287	102	100	26	2,541
Steam Electric Power	92	99	93	3	6
Commercial-Institutional	0	0	0	0	0
Industrial	195	3	7	23	2,535
UTAH INTRASTATE- AQCR	20,817	11,451	24,847	29,098	134,796
Area Sources	7,800	4,100	20,400	29,000	134,400
Point Sources	13,017	7,351	4,447	98	396
Steam Electric Power	5,195	3,680	3,500	58	193
Commercial-Industrial	66	123	87	4	7
Industrial	7,756	3,548	860	36	196
WASATCH FRONT INTRASTATE-AQCR	45,425	147,920	71,236	80,099	346,114
Area Sources	17,100	10,600	51,300	70,300	335,200
Point Sources	28,325	137,320	19,936	9,799	10,914
Steam Electric Power	608	7,608	6,212	120	243
Commercial-Institutional	783	1,183	1,164	80	111
Industrial	26,934	128,529	12,560	9,599	10,560

Table 2. Tons of pollutant/year

County	Particulate	SO_2	NO_x	HC	CO
BEAVER - 0040	400	200	800	1,300	5,700
Area Sources	400	200	800	1,300	5,700
Point Sources	0	0	0	0	0
Steam Electric Power	0	0	0	0	0
Commercial-Institutional	0	0	0	0	0
Industrial	0	0	0	0	0
BOX ELDER - 0080	2,671	1,432	4,386	6,609	28,612
Area Sources	2,600	800	4,200	6,600	28,600
Point Sources	71	632	186	9	12
Steam Electric Power	0	0	0	0	0
Commercial-Institutional	0	0	0	0	0
Industrial	71	632	186	9	12
CACHE - 0120	1,519	750	2,799	3,906	19,909
Area Sources	1,300	600	2,700	3,900	19,900
Point Sources	219	150	9	6	9
Steam Electric Power	0	0	0	0	0
Commercial-Institutional	66	123	87	4	7
Industrial	153	27	12	2	2
CARBON - 0140	5,810	4,302	5,080	1,763	9,406
Area Sources	500	500	1,500	1,700	9,100
Point Sources	5,310	3,802	3,580	63	306
Steam Electric Power	5,195	3,680	3,500	58	193
Commercial-Institutional	0	0	0	0	0
Industrial	115	122	80	5	113
DAGGETT- 0200	0	0	100	200	900
Area Sources	0	0	100	200	900
Point Sources	0	0	0	0	0
Steam Electric Power	0	0	0	0	0
Commercial-Institutional	0	0	0	0	0
Industrial	0	0	0	0	0

Table 2. (continued)

County	Particulate	SO_2	NO_x	HC	CO
DAVIS - 0220	4,600	13,200	9,063	12,326	51,198
Area Sources	3,500	1,300	6,500	8,700	51,100
Point Sources	1,100	11,900	2,563	3,626	98
Steam Electric Power	127	178	147	7	13
Commercial-Institutional	39	176	209	8	11
Industrial	934	11,546	2,207	3,611	80
DUCHESNE - 0260	201	201	1,301	1,802	8,726
Area Sources	200	200	1,300	1,800	8,700
Point Sources	1	1	1	2	26
Steam Electric Power	0	0	0	0	0
Commercial-Institutional	0	0	0	0	0
Industrial	1	1	1	2	26
EMERY- 0280	200	300	1,200	1,400	6,200
Area Sources	200	300	1,200	1,400	6,200
Point Sources	0	0	0	0	0
Steam Electric Power	0	0	0	0	0
Commercial-Institutional	0	0	0	0	0
Industrial					
GARFIELD - 0300	495	103	607	923	6,535
Area Sources	300	100	600	900	4,000
Point Sources	195	3	7	23	2,535
Steam Electric Power	0	0	0	0	0
Commercial-Institutional	0	0	0	0	0
Industrial	195	3	7	23	2,535
GRAND - 0320	200	300	1,400	1,400	6,300
Area Sources	200	300	1,400	1,400	6,300
Point Sources	0	0	0	0	0
Steam Electric Power	0	0	0	0	0
Commercial-Institutional	0	0	0	0	0
Industrial	0	0	0	0	0

Table 2. (continued)

County	Particulate	SO_2	NO_x	HC	CO
IRON - 0360	492	499	1,793	7,003	9,806
Area Sources	400	400	1,700	7,000	9,800
Point Sources	92	99	93	3	6
Steam Electric Power	92	99	93	3	6
Commercial-Institutional	0	0	0	0	0
Industrial	0	0	0	0	0
JUAB - 0380	4,500	6,400	1,100	600	1,900
Area Sources	4,500	6,400	1,100	600	1,900
Point Sources	0	0	0	0	0
Steam Electric Power	0	0	0	0	0
Commercial-Institutional	0	0	0	0	0
Industrial	0	0	0	0	0
KANE - 0400	100	100	600	800	3,800
Area Sources	100	100	600	800	3,800
Point Sources	0	0	0	0	0
Steam Electric Power	0	0	0	0	0
Commercial-Institutional	0	0	0	0	0
Industrial	0	0	0	0	0
MILLARD - 0560	300	300	1,700	2,100	10,400
Area Sources	300	300	1,700	2,100	10,400
Point Sources	0	0	0	0	0
Steam Electric Power	0	0	0	0	0
Commercial-Institutional	0	0	0	0	0
MORGAN - 0600	1,472	2,796	1,050	706	3,426
Area Sources	200	200	600	700	3,400
Point Sources	1,272	2,596	450	6	26
Steam Electric Power	0	0	0	0	0
Commercial-Institutional	0	0	0	0	0
Industrial	1,272	2,596	450	6	26

Table 2. (continued)

County	Particulate	SO_2	NO_x	HC	CO
PIUTE - 0740	100	0	200	400	1,700
Area Sources	100	0	200	400	1,700
Point Sources	0	0	0	0	0
Steam Electric Power	0	0	0	0	0
Commercial-Institutional	0	0	0	0	0
Industrial	0	0	0	0	0
RICH - 0820	0	0	200	400	2,100
Area Sources	0	0	200	400	2,100
Point Sources	0	0	0	0	0
Steam Electric Power	0	0	0	0	0
Commercial-Institutional	0	0	0	0	0
Industrial	0	0	0	0	0
SALT LAKE - 0900	11,776	125,122	41,602	39,101	203,459
Area Sources	4,600	5,300	26,100	37,200	202,600
Point Sources	7,176	119,822	14,572	1,901	859
Steam Electric Power	350	7,082	5,649	91	208
Commercial-Institutional	334	570	570	42	29
Industrial	6,492	112,170	8,383	1,768	622
SAN JUAN - 0960	200	100	1,000	1,200	6,100
Area Sources	200	100	1,000	1,200	6,100
Point Sources	0	0	0	0	0
Steam Electric Power	0	0	0	0	0
Commercial-Institutional	0	0	0	0	0
Industrial	0	0	0	0	0
SAN PETE - 0980	600	400	1,200	1,800	8,700
Area Sources	600	400	1,200	1,800	8,700
Point Sources	0	0	0	0	0
Steam Electric Power	0	0	0	0	0
Commercial-Institutional	0	0	0	0	0
Industrial	0	0	0	0	0

Table 2. (continued)

County	Particulate	SO_2	NO_x	HC	CO
SEIVER - 1000	4,392	407	1,355	1,905	9,208
Area Sources	500	300	1,300	1,900	9,200
Point Sources	3,892	107	55	5	8
Steam Electric Power	0	0	0	0	0
Commercial-Institutional	0	0	0	0	0
Industrial	3,892	107	55	5	8
SUMMITT - 1120	440	162	858	1,704	3,908
Area Sources	200	100	800	1,700	3,900
Point Sources	240	62	58	4	8
Steam Electric Power	0	0	0	0	0
Commercial-Institutional	0	0	0	0	0
Industrial	240	62	58	4	8
TOOELE - 1180	11,598	1,385	3,377	3,790	17,396
Area Sources	1,500	400	2,800	3,500	17,300
Point Sources	10,098	985	577	290	96
Steam Electric Power	0	0	0	0	0
Commercial-Institutional	250	135	129	13	34
Industrial	9,848	850	448	277	62
UNITAH - 1200	2,412	201	1,318	1,603	7,901
Area Sources	400	200	1,300	1,600	7,900
Point Sources	2,012	1	18	3	1
Steam Electric Power	0	0	0	0	0
Commercial-Institutional	0	0	0	0	0
Industrial	2,012	1	18	3	1
UTAH - 1220	14,097	6,418	11,184	16,629	83,100
Area Sources	4,600	1,900	9,100	12,700	74,300
Point Sources	9,497	4,518	2,084	3,929	8,800
Steam Electric Power	131	348	416	22	22
Commercial-Institutional	156	285	225	16	36
Industrial	9,210	3,885	1,443	3,891	8,752

Table 2. (continued)

County	Particulate	SO_2	NO_x	HC	CO
WASATCH - 1260	200	100	1,200	1,400	6,900
Area Sources	200	100	1,200	1,400	6,900
Point Sources	0	0	0	0	0
Steam Electric Power	0	0	0	0	0
Commercial-Institutional	0	0	0	0	0
Industrial	0	0	0	0	0
WASHINGTON - 1280	300	200	1,700	2,100	10,800
Area Sources	300	200	1,700	2,100	10,800
Point Sources	0	0	0	0	0
Steam Electric Power	0	0	0	0	0
Commercial-Institutional	0	0	0	0	0
Industrial	0	0	0	0	0
WAYNE - 1320	0	100	200	300	1,500
Area Sources	0	100	200	300	1,500
Point Sources	0	0	0	0	0
Steam Electric Power	0	0	0	0	0
Commercial-Institutional	0	0	0	0	0
Industrial	0	0	0	0	0
WEBER - 1340	3,354	1,795	6,940	10,953	57,851
Area Sources	2,900	1,700	6,800	10,900	56,800
Point Sources	454	95	140	53	1,051
Steam Electric Power	0	0	0	0	0
Commercial-Institutional	4	17	31	1	1
Industrial	450	78	109	52	1,050

Table 3. Emission rate (10^{-3} tons/day)

GRIDS	AREA mi^2	PART	SO_2	NO_x	HC	CO
All	5251.9	82,088	413,150	200,059	196,887	755,940
1-106	4643.9	3,801	302,768	83,513	43,361	184,220
107-135	57.9	6,096	3,911	9,541	14,670	62,873
136-159	115.8	2,721	1,968	5,354	8,471	27,702
160-171	57.9	2,908	1,526	4,089	8,857	21,764
172-234	115.8	22,225	78,469	60,708	62,753	234,728
235-273	144.8	14,304	7,052	20,867	32,351	139,399
274-312	115.8	30,033	17,456	15,987	26,424	85,254

Table 4. General grid data in 10^{-3} tons per day per mi^2

Grid No.	Area (mi^2)	P	SO_2	NO_x	HC	CO
1	154.4402	0.57	0.49	3.38	3.38	19.39
2	38.6100	1.87	2.99	6.73	6.88	27.06
3	38.6100	4.34	2.90	9.78	15.38	69.24
4	38.6100	6.44	4.72	14.77	20.43	85.31
5	9.6525	5.19	10.08	15.71	14.20	43.31
6	9.6525	9.60	5.82	18.07	32.69	150.14
7	38.6100	4.53	3.33	10.52	15.13	64.34
8	9.6525	0.66	0.56	3.55	4.15	20.46
9	9.6525	0.66	0.56	3.55	4.15	20.46
10	38.6100	0.66	0.56	3.56	4.15	20.48
11	38.6100	0.66	0.56	3.56	4.15	20.48
12	154.4402	0.38	0.35	3.05	3.35	17.27
13	154.4402	0.25	0.26	2.81	2.98	15.79
14	9.6525	1.34	1.04	4.78	6.08	28.18
15	9.6525	8.30	4.89	15.73	29.01	107.05
16	9.6525	0.55	0.42	3.40	4.06	19.82
17	9.6525	35.86	48.96	58.67	4.37	18.14
18	9.6525	0.10	0.15	2.47	2.67	14.73
19	9.6525	101.11	72.53	184.68	289.55	1160.61
20	9.6525	2.34	1.76	6.59	8.92	39.54
21	9.6525	1.39	0.94	5.10	6.62	29.23
22	9.6525	1.72	1.14	5.77	7.61	32.90
23	9.6525	2.08	1.36	6.49	8.70	36.89
24	38.6100	0.10	0.15	2.47	2.67	14.73
25	38.6100	0.10	0.15	2.47	2.67	14.73
26	154.4402	0.66	0.49	3.62	4.39	21.06
27	38.6100	0.85	0.61	4.01	4.97	23.17
28	38.6100	11.96	3.23	11.84	33.14	111.06
29	38.6100	0.71	0.52	3.71	4.53	21.57
30	9.6525	0.32	0.58	3.73	5.04	28.04
31	9.6525	46.64	11.67	41.46	120.58	394.50
32	38.6100	22.15	150.83	86.70	60.50	85.57
33	38.6100	1.68	1.11	5.69	7.49	32.45
34	38.6100	1.76	1.16	5.84	7.73	33.31
35	154.4402	64.91	1830.62	250.31	29.09	168.91
36	38.6100	16.52	3.85	18.35	36.19	128.99
37	38.6100	322.68	174.04	272.51	15.49	74.86
38	9.6525	46.64	11.67	41.45	120.56	394.43
39	9.6525	4.06	2.30	13.92	13.56	63.76
40	9.6525	57.62	37.06	95.74	134.30	543.62
41	9.6525	4.06	2.30	13.92	13.56	63.76
42	9.6525	4.06	2.30	13.92	13.56	63.76
43	9.6525	4.06	2.30	13.92	13.56	63.76
44	9.6525	4.06	2.30	13.92	13.56	63.76
45	154.4402	1.72	1.22	10.68	8.23	41.44
46	38.6100	3.00	3.35	13.59	11.47	52.64
47	38.6100	8.00	10.08	105.27	18.39	102.04
48	9.6525	1.93	1.32	10.96	8.71	43.43
49	9.6525	1.93	1.32	10.96	8.71	43.43
50	9.6525	19.09	9.25	34.76	47.91	207.36
51	9.6525	5.51	2.97	15.93	16.87	77.65
52	9.6525	58.97	37.60	97.61	137.37	556.71
53	9.6525	15.22	17.47	36.94	37.67	138.72
54	9.6525	6.72	3.27	17.38	21.16	100.19

Table 4. (continued)

Grid No.	Area	P	SO_2	NO_x	HC	CO
55	9.6525	6.15	3.27	16.81	18.32	83.73
56	9.6525	4.06	2.30	13.92	13.56	63.76
57	9.6525	4.06	2.30	13.92	13.56	63.76
58	38.6100	1.54	1.14	10.42	7.81	39.69
59	154.4402	1.21	0.65	3.16	4.05	18.03
60	154.4402	0.25	0.17	1.66	1.89	9.70
61	9.6525	3.41	5.23	15.49	11.65	47.22
62	9.6525	0.36	0.23	1.84	2.15	10.71
63	38.6100	0.24	0.17	1.65	1.88	9.68
64	9.6525	1.20	0.64	3.14	4.03	17.94
65	9.6525	51.17	29.32	77.19	97.02	379.02
66	9.6525	1.20	0.64	3.14	4.03	17.94
67	9.6525	51.32	25.20	80.86	115.80	448.71
68	9.6525	21.89	14.02	37.45	49.82	186.89
69	9.6525	2.80	1.42	5.61	7.58	31.62
70	9.6525	1.20	0.64	3.14	4.03	17.94
71	9.6525	1.20	0.64	3.14	4.03	17.94
72	38.6100	1.21	0.65	3.15	4.03	17.96
73	9.6525	1.20	0.64	3.14	4.03	17.94
74	38.6100	0.09	0.10	1.42	1.55	8.38
75	38.6100	1.21	0.65	3.15	4.03	17.96
76	154.4402	0.20	0.15	1.58	1.78	9.28
77	38.6100	78.72	0.24	1.72	1.95	9.75
78	38.6100	0.30	0.20	1.74	2.00	10.14
79	9.6525	1.66	0.87	3.85	5.04	21.85
80	9.6525	1.66	0.87	3.85	5.04	21.85
81	38.6100	2.28	1.17	4.82	6.43	27.21
82	9.6525	4.78	1.99	7.31	16.66	82.71
83	9.6525	2.80	1.43	5.62	7.59	31.69
84	9.6525	3.66	1.43	6.48	11.28	52.41
85	9.6525	6.82	6.63	14.07	16.19	57.29
86	38.6100	1.33	0.71	3.34	4.31	19.02
87	9.6525	15.37	7.58	25.10	35.61	139.66
88	9.6525	0.26	0.18	1.67	1.91	9.80
89	9.6525	0.26	0.18	1.67	1.91	9.80
90	154.4402	0.23	0.17	1.63	1.86	9.58
91	154.4402	0.26	0.18	1.68	1.92	9.83
92	154.4402	3.17	2.21	6.60	8.34	33.15
93	9.6525	20.39	21.12	59.92	82.15	311.48
94	9.6525	0.94	0.51	2.73	3.43	15.66
95	38.6100	1.16	1.12	2.70	3.36	15.16
96	9.6525	32.55	19.26	53.98	73.58	278.40
97	9.6525	8.52	4.23	14.49	20.34	80.82
98	38.6100	4.15	2.09	7.71	10.60	43.25
99	38.6100	1.47	0.77	3.55	4.61	20.20
100	154.4402	0.60	0.35	2.20	2.67	12.70
101	154.4402	0.59	0.88	2.38	2.26	9.74
102	154.4402	0.31	0.20	1.75	2.03	10.23
103	154.4402	0.40	0.25	1.89	2.23	11.02
104	154.4402	0.20	0.15	1.58	1.79	9.30
105	154.4402	0.21	0.16	1.60	1.81	9.40
106	154.4402	0.16	0.13	1.52	1.69	8.95
107	2.4131	41.85	43.03	32.62	102.68	369.12
108	2.4131	58.89	42.28	108.55	169.60	681.40
109	2.4131	76.84	55.15	140.92	220.61	885.18
110	2.4131	4.61	3.38	10.67	15.36	65.25
111	2.4131	35.90	25.81	67.09	104.27	420.44
112	2.4131	144.37	111.69	267.87	408.83	1614.62
113	2.4131	131.64	108.05	248.40	370.22	1445.29
114	2.4131	1.45	1.12	4.97	6.38	29.37
115	1.0734	12.94	9.35	25.69	39.03	159.79
116	1.0734	35.39	25.44	66.18	102.83	414.68
117	1.0734	1139.79	241.97	430.23	485.21	4476.15

Table 4. (continued)

Grid No.	Area	P	SO_2	NO_x	HC	CO
118	1.0734	173.11	144.95	357.98	561.56	2411.28
119	1.0734	284.48	203.95	535.72	917.86	4177.88
120	1.0734	284.39	203.97	610.07	1065.42	5032.15
121	2.4131	227.03	162.76	411.73	647.33	2589.87
122	2.4131	1.45	1.12	4.97	6.38	29.37
123	1.0734	29.37	21.13	55.33	85.74	346.39
124	1.0734	177.04	147.77	371.15	562.76	2299.60
125	1.0734	228.75	163.94	367.72	612.50	2632.80
126	2.4131	170.66	122.37	310.09	487.17	1950.04
127	2.4131	1.45	1.12	4.97	6.38	29.37
128	2.4131	50.38	36.18	93.20	145.41	584.76
129	2.4131	253.91	178.24	422.23	637.30	2503.91
130	2.4131	221.70	158.94	402.12	632.18	2529.35
131	2.4131	6.26	4.50	18.58	16.44	66.15
132	2.4131	23.51	16.93	44.75	69.07	279.90
133	2.4131	12.59	24.18	36.66	31.31	87.62
134	2.4131	4.59	3.37	10.63	15.30	65.01
135	2.4131	4.59	3.37	10.63	15.30	65.01
136	9.6525	11.96	7.39	26.53	38.75	147.31
137	2.4131	38.95	23.85	81.21	120.79	448.74
138	2.4131	28.90	17.72	60.84	90.23	336.46
139	2.4131	61.49	30.31	96.45	190.61	585.09
140	2.4131	21.71	13.33	46.27	68.37	256.14
141	9.6525	94.15	85.91	162.20	283.00	705.11
142	9.6525	10.77	6.86	16.98	34.37	96.54
143	9.6525	0.85	0.61	4.00	4.96	23.16
144	9.6525	5.88	3.67	14.20	20.26	79.35
145	2.4131	49.78	30.46	103.17	153.73	569.77
146	2.4131	34.28	21.00	71.76	106.61	396.65
147	2.4131	35.83	21.95	74.90	111.32	413.94
148	2.4131	34.28	21.00	71.76	106.61	396.65
149	2.4131	35.83	21.95	74.90	111.32	413.94
150	2.4131	58.73	35.92	121.31	180.95	669.79
151	2.4131	18.38	15.37	41.52	56.14	201.89
152	2.4131	27.41	20.88	59.83	83.60	302.79
153	9.6525	0.85	0.61	4.00	4.96	23.16
154	9.6525	0.85	0.61	4.00	4.96	23.16
155	9.6525	21.69	13.32	46.24	68.33	255.97
156	2.4131	27.80	17.05	58.62	86.90	324.20
157	2.4131	27.82	17.06	58.66	86.96	324.42
158	2.4131	14.85	13.22	34.37	45.42	162.50
159	2.4131	23.75	18.64	52.40	72.46	261.86
160	9.6525	5.39	3.38	13.21	18.78	73.93
161	9.6525	20.27	21.51	36.23	129.77	137.01
162	2.4131	132.42	80.87	270.65	404.98	1492.93
163	2.4131	187.83	114.67	382.93	573.43	2111.88
164	2.4131	17.22	10.59	37.18	54.73	206.02
165	2.4131	211.17	24.33	82.80	123.17	457.49
166	9.6525	5.15	3.23	12.73	18.05	71.25
167	9.6525	36.03	39.05	55.48	294.04	283.65
168	2.4131	108.26	66.14	221.69	331.53	1223.07
169	2.4131	4.52	2.85	11.45	16.13	64.20
170	2.4131	271.88	61.37	205.85	307.76	1135.75
171	2.4131	4.52	2.85	11.45	16.13	64.20
172	2.4131	15.31	7.50	29.51	39.18	171.21
173	2.4131	20.22	9.77	36.33	50.38	218.17
174	2.4131	15.31	7.50	29.51	39.18	171.21
175	2.4131	19.98	9.66	35.99	49.84	215.88
176	2.4131	374.92	10557.22	1231.07	2161.98	132.86
177	2.4131	154.12	73.53	328.47	557.64	2618.44
178	2.4131	18.13	16.09	154.96	43.29	175.29
179	2.4131	750.49	9894.95	4436.03	3284.61	2524.58
180	2.4131	13.87	6.83	27.52	35.91	157.46

Table 4. (continued)

Grid No.	Area	P	SO_2	NO_x	HC	CO
181	2.4131	19.25	10.82	118.28	217.63	1200.68
182	2.4131	13.87	6.83	27.52	35.91	157.46
183	2.4131	11.65	5.81	24.44	30.85	136.27
184	9.6525	7.92	4.09	19.27	22.35	100.62
185	9.6525	12.17	5.92	24.77	31.40	139.56
186	2.4131	567.67	7876.89	6532.31	767.17	3525.76
187	2.4131	159.13	80.03	202.60	332.17	1462.76
188	0.6033	234.88	177.29	1011.54	1695.10	8325.71
189	0.6033	244.07	136.19	860.33	1523.77	7703.44
190	2.4131	635.27	496.47	1301.71	1730.00	8418.63
191	0.6033	960.58	206.80	1026.60	1885.45	10293.75
192	0.6033	566.78	332.25	1918.57	2795.51	15065.67
193	0.6033	967.91	1459.55	1646.92	2000.01	10561.07
194	0.6033	916.74	433.46	1813.59	3326.12	16666.64
195	0.6033	545.63	254.90	901.87	1620.92	7854.54
196	0.6033	316.84	152.60	770.99	1428.82	7367.77
197	0.6033	477.44	224.32	857.87	1407.45	6143.57
198	0.6033	1029.88	474.69	1360.01	2388.40	10962.28
199	0.6033	859.29	394.19	1028.92	1779.92	7921.06
200	0.6033	668.64	267.56	939.35	1622.18	7789.97
201	0.6033	138.01	62.81	124.54	194.46	745.89
202	0.6033	508.01	232.79	587.35	1005.53	4413.71
203	0.6033	369.79	170.17	463.13	799.52	3601.84
204	0.6033	494.00	223.49	411.56	659.49	2459.56
205	0.6033	39.41	18.63	62.92	94.09	401.43
206	0.6033	753.73	1251.01	1934.38	234.00	288.19
207	0.6033	43.09	22.39	182.52	338.47	1831.78
208	0.6033	430.04	195.59	413.85	683.25	2769.45
209	9.6525	35.51	16.83	57.52	85.22	364.20
210	9.6525	69.12	34.99	100.98	133.43	562.19
211	2.4131	100.34	48.72	255.29	431.44	2053.33
212	2.4131	68.01	33.39	188.75	343.40	1792.72
213	2.4131	142.09	73.64	434.94	653.61	2675.08
214	2.4131	217.83	109.47	586.84	941.80	4166.83
215	0.6033	634.14	294.15	934.99	1660.35	7842.00
216	0.6033	525.04	262.23	1805.92	2942.22	13300.71
217	0.6033	494.51	228.04	651.01	1136.44	5203.84
218	0.6033	623.28	285.22	703.17	1201.71	5231.15
219	0.6033	749.47	345.26	975.34	1705.12	7793.42
220	0.6033	334.97	169.21	1252.27	2178.85	10709.13
221	0.6033	503.25	233.58	746.43	1316.17	6179.48
222	0.6033	494.56	226.94	589.18	1013.21	4494.33
223	0.6033	746.21	334.14	438.22	636.90	1647.02
224	0.6033	350.34	163.85	583.52	968.01	4272.44
225	0.6033	721.01	327.23	665.44	1058.78	3968.85
226	0.6033	541.90	245.91	494.64	810.64	3200.11
227	0.6033	549.83	250.27	544.25	889.12	3548.51
228	0.6033	325.08	150.84	474.13	777.25	3332.05
229	0.6033	462.09	211.29	507.80	853.05	3624.82
230	0.6033	542.60	246.42	505.84	832.75	3325.47
231	2.4131	267.98	124.21	379.86	614.92	2585.07
232	2.4131	307.67	141.59	383.39	616.99	2526.45
233	2.4131	12.28	6.10	25.31	32.29	142.29
234	2.4131	15.28	7.48	29.47	39.12	170.92
235	9.6525	45.59	21.49	71.50	108.18	460.48
236	9.6525	97.81	45.61	143.90	227.17	959.36
237	2.4131	169.83	79.63	286.39	507.39	2461.24
238	2.4131	98.91	45.88	132.58	222.22	1011.50
239	2.4131	92.78	66.02	423.25	693.62	3331.96
240	2.4131	128.91	93.71	521.15	547.28	2590.82
241	2.4131	358.47	165.39	472.65	821.88	3761.17
242	2.4131	232.35	108.82	390.40	695.87	3377.05
243	2.4131	310.32	141.04	288.49	469.40	1862.37

Table 4. (continued)

Grid No.	Area	P	SO_2	NO_x	HC	CO
244	2.4131	204.43	93.93	241.28	407.12	1790.35
245	2.4131	331.33	151.24	345.22	547.93	2129.06
246	2.4131	152.61	68.96	111.81	164.70	535.09
247	2.4131	183.16	85.03	262.25	421.64	1774.72
248	2.4131	3.32	1.96	12.89	11.87	56.67
249	9.6525	46.73	22.01	73.06	110.78	471.37
250	9.6525	57.22	31.31	90.99	134.11	557.59
251	2.4131	95.35	43.49	86.34	131.15	496.86
252	2.4131	66.94	49.24	119.42	174.95	775.85
253	2.4131	180.55	105.22	323.59	479.37	1923.27
254	2.4131	229.83	124.35	338.45	522.03	2148.74
255	2.4131	243.87	111.25	246.57	405.81	1676.12
256	2.4131	177.09	81.15	194.95	323.02	1380.23
257	2.4131	197.87	90.01	182.68	292.32	1147.26
258	2.4131	134.46	60.90	104.69	155.96	533.85
259	2.4131	151.46	57.68	121.66	173.19	655.61
260	2.4131	168.24	78.78	277.79	490.73	2369.60
261	2.4131	163.43	75.92	234.90	376.70	1586.31
262	2.4131	11.26	5.63	23.90	29.96	132.55
263	9.6525	34.17	20.65	59.02	81.58	337.32
264	9.6525	4.70	2.60	14.81	15.02	69.91
265	9.6525	63.29	38.57	102.77	147.36	601.50
266	2.4131	136.34	63.40	197.33	314.96	1327.46
267	2.4131	42.94	20.26	67.83	102.15	435.21
268	2.4131	51.45	24.20	79.63	121.55	516.54
269	2.4131	64.25	30.11	97.38	150.71	638.80
270	2.4131	100.10	46.67	147.08	232.39	981.27
271	2.4131	34.43	16.33	56.03	82.76	353.89
272	2.4131	6.88	3.61	17.83	19.99	90.75
273	2.4131	6.32	3.35	17.04	18.70	85.30
274	2.4131	37.35	18.35	59.19	84.64	328.62
275	2.4131	27.87	20.90	49.43	62.71	227.39
276	2.4131	67.89	33.32	106.55	152.75	591.08
277	2.4131	33.50	16.47	53.22	76.05	295.52
278	9.6525	12.79	6.32	21.11	29.86	117.50
279	9.6525	2178.10	1272.48	417.22	1208.80	1328.50
280	2.4131	33.77	16.60	53.65	76.66	297.87
281	2.4131	146.95	72.05	229.13	329.06	1270.57
282	2.4131	57.62	114.24	211.46	85.75	303.54
283	2.4131	136.49	152.88	333.76	261.65	981.46
284	9.6525	25.74	11.14	38.31	50.81	197.41
285	9.6525	10.17	8.63	19.51	23.63	85.13
286	2.4131	107.28	52.62	167.63	240.60	929.65
287	2.4131	125.42	68.69	200.70	280.28	1065.36
288	2.4131	151.43	74.25	236.09	339.07	1309.14
289	2.4131	280.76	255.48	372.34	374.64	1466.28
290	2.4131	62.61	30.73	98.36	140.98	545.73
291	2.4131	407.00	470.00	629.96	557.37	2385.29
292	2.4131	0.87	0.48	2.63	3.28	15.07
293	2.4131	0.87	0.48	2.63	3.28	15.07
294	2.4131	110.95	60.51	174.62	256.04	1004.62
295	2.4131	28.03	12.70	41.11	71.90	311.69
296	0.6033	361.76	177.30	562.24	808.16	3116.94
297	0.6033	281.59	138.02	437.91	629.35	2427.81
298	0.6033	678.53	323.26	587.29	788.85	2287.27
299	0.6033	239.21	119.97	510.15	834.68	3940.58
300	2.4131	24.34	24.14	47.37	54.30	183.42
301	0.6033	806.50	386.47	811.89	1147.09	3898.14
302	0.6033	202.22	102.47	484.26	802.86	3878.91
303	0.6033	357.03	174.98	554.91	797.61	3076.28
304	0.6033	80.23	39.36	125.68	180.27	697.16
305	2.4131	507.24	23.83	67.43	82.37	305.08
306	2.4131	25.13	12.37	40.24	57.39	223.58

Table 4. (continued)

Grid No.	Area	P	SO_2	NO_x	HC	CO
307	2.4131	25.13	12.37	40.24	57.39	223.58
308	2.4131	22.56	18.30	41.20	50.88	181.77
309	2.4131	182.09	21.94	70.72	83.99	6498.59
310	2.4131	21.95	10.81	35.31	50.29	196.22
311	2.4131	73.44	36.03	115.15	165.12	638.78
312	9.6525	22.06	10.86	35.48	50.54	197.19

Table 5. Emission factor (lb/unit)

Category	Unit	Part	SO_2	NO_4	HC	CO
Residential						
Bituminous Coal	Ton	20.0	38.0S	3.0	20.0	90.0
Distillate Oil	10^3 gal	10.0	142.0S	12.0	3.0	5.0
Natural Gas	10^6 ft	19.0	0.6	50.0	8.0	20.0
Commercial Institutional						
Bituminous Coal	Ton	5.8A	38.0S	9.2	2.0	7.2
Distillate Oil	10^3 gal	15.0	142.0S	60.0	3.0	0.2
Residual Oil	10^3 gal	23.0	157.0S	60.0	3.0	0.2
Natural Gas	10^6 ft^3	19.0	0.6	100.0	8.0	20.0
Industrial						
Bituminous Coal	Ton	13.0A	38.0S	15.0	1.0	2.0
Distillate Oil	10^3 gal	10.0	142.0S	12.0	3.0	5.0
Residual Oil	10^3 gal	23.0	157.0S	60.0	3.0	0.2
Natural Gas	10^6 ft^3	18.0	0.6	180.0	40.0	0.4
Diesal Fuel						
Off Highway	10^3 gal	13.0	27.0	370.0	37.0	225.0
Railroads	10^3 gal	25.0	65.0	75.0	50.0	70.0
Incineration						
Industrial	Tons	12.0	1.5	2.0	10.0	20.0
Commercial	Tons	12.0	1.5	2.0	10.0	20.0
Off-Highway Gasoline	10^3 gal	8.0	5.0	176.0	553.0	3030.0
Aircraft						
Military	LTO CYC	19.9	3.8	9.6	46.3	49.7
Civil	LTO CYC	0.57	0.11	0.51	2.52	14.4
Commercial	LTO CYC	19.5	4.3	12.2	46.0	111.0

A = Fuel Ash Content

S = Fuel Sulfur Content

Table 6. Factors for area source emissions from mobile sources

CATEGORY	PART	SOX	NOX	HC	CO
Limited Access Roads					
Light Duty - Gasoline	0.300	0.180	4.300	7.800	34.000
Heavy Duty - Gasoline	0.300	0.180	10.000	16.000	58.000
Heavy Duty - Diesel	1.200	2.400	34.000	3.400	20.000
Rural Roads					
Light Duty - Gasoline	0.300	0.180	4.300	8.000	37.000
Heavy Duty - Gasoline	0.300	0.180	10.000	17.000	63.000
Heavy Duty - Diesel	1.200	2.400	34.000	3.400	20.000
Suburban Roads					
Light Duty - Gasoline	0.300	0.180	4.300	8.800	45.000
Heavy Duty - Gasoline	0.300	0.180	10.000	19.000	76.000
Heavy Duty - Diesel	1.200	2.400	34.000	3.400	20.000
Urban Roads					
Light Duty - Gasoline	0.300	0.180	4.300	10.000	59.000
Heavy Duty - Gasoline	0.300	0.180	10.000	23.000	100.000
Heavy Duty - Diesel	1.200	2.400	34.000	3.400	20.000

APPENDIX A

Motor Vehicle Emission Calculations

All data for the following calculations are taken from NEDS area source forms. The first step in estimating motor vehicle emissions is to establish the mileage ratios for the different classes of vehicles:

1) Multiply gasoline fuel for light vehicles times 1000 times 13.6 (mpg).
2) Multiply gasoline fuel for heavy vehicles times 1000 times 8.4 (mpg).
3) Multiply diesel fuel for heavy vehicles times 1000 times 5.0 (mpg).

Add the products - SUM of vehicle miles traveled. (M_T)
Obtain ratio of vehicle mile total for category of vehicle.

$$R_{LD} = \frac{(1)}{SUM} = ._____$$

$$R_{HDG} = \frac{(2)}{SUM} = ._____$$

$$R_{HDD} = \frac{(3)}{SUM} = ._____$$

If any measured vehicle miles are filled in, proceed as follows:
Then multiply each ration from above times each "Measured Vehicle Miles" category, times appropriate emission factor, i.e.

Limited Access Road - miles (M_L) times 10,000 times R_{LD} times appropriate emission factor plus M_L times 10,000 R_{HDG} times appropriate emission factor plus M_L times 10,000 R_{HDD} times appropriate emission factor.

$\frac{1}{453.6\ 2000}$ times sum is the emissions for limited access roads in tons_____.

Rural Roads - miles (M_R) times 10,000 times R_{LD} times appropriate emission factor plus M_R times 10,000 times R_{HDG} times appropriate emission factor plus M_R times 10,000 R_{HDD} times appropriate emission factor.

$\frac{1}{453.6 \times 2000}$ x sum is the emissions for rural roads in tons _____.

Suburban Roads - miles (M_S) times 10,000 R_{LD} times appropriate emission factor plus M_S times 10,000 times R_{HDG} times appropriate emission factor plus M_S times 10,000 R_{HDD} times appropriate emission factor.

$\frac{1}{453.6 \times 2000}$ x sum is the emissions for suburban roads in tons _____.

Urban Roads - miles (Mu) times 10,000 R_{LD} times appropriate emission factor plus Mu times 10,000 times R_{HDG} times appropriate emissions factor plus Mu times 10,000 times R_{HDD} times appropriate emission factor.

$\frac{1}{453.6 \times 2000}$ x sum is the emissions for urban roads in tons _____.

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